

REMARKS

Claims 1, 3, 7 and 9 through 12 are pending in this application. Claims 1 and 3 have been amended and claim 5 cancelled. Care has been exercised to avoid the introduction of new matter. Indeed, adequate descriptive support for the present Amendment should be apparent throughout the originally filed disclosure as, for example, Figs. 1 and 2 and the related discussion thereof in the written description thereof in the written description of the specification, Applicant submits that the present Amendment does not generate any new matter issue.

A clean copy of amended claims 1 and 3 appear in the Appendix hereto.

Applicant notes a regrettable typographical oversight in that the clean copy of claim 1 appearing in the Appendix to the previously submitted Amendment on July 10, 2002 does not accurately reflect amended claim 1 as it was amended in that response. In order to clarify the record, Applicant submits herewith, as Exhibit A, a clean copy of amended claim 1 as it should have appeared in the Amendment submitted July 10, 2002.

Claims 1, 3 and 5 were rejected under 35 U.S.C. §103 for obviousness predicated upon Hembree in view of Tao et al. and Shermer et al.

In the statement of the rejection, the Examiner admitted that Hembree does not disclose the external connections and convex portions that do not protrude from the sealing member to the outside. The Examiner, however, concluded that one having ordinary skill in the art would have been motivated to modify the semiconductor device disclosed by Hembree et al. by forming external connections and forming the heat sink

plate such that the convex portions do not protrude from the surface of the sealing member in view of Tao et al. and Shermer et al. This rejection is traversed.

Firstly, independent claim 1 specifies that the heat sink plate is disposed to make direct contact with the main surface on which the semiconductor elements of the semiconductor chip are formed. It is not apparent wherein Hembree discloses or suggests such a feature. In fact, advertizing to the Fig. 3F embodiment of Hembree which is relied upon by the Examiner, it should be apparent that heat sink 30 is **not** in direct contact with the chip 12, by virtue of the adhesive 34 positioned therebetween. In this respect, Applicant would further refer to column 5 of Hembree, lines 49 through 53.

The secondary references do not cure the above argued deficiency of Hembree. Ergo, even if the applied references are combined, the claimed invention would **not** result. *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 USPQ2d 1434 (Fed. Cir. 1988).

Applicant submits that the above argued difference between the claimed invention and the applied prior art is functionally significant. In this respect, Applicant would refer to the second paragraph on page 4 of the written description of the specification, wherein it is disclosed that positioning the heat sink in direct contact with the semiconductor chip enables heat generated in a main surface of the semiconductor chip to be dissipated with greater efficiency. There is no apparent factual basis of record upon which to predicate the conclusion that one having ordinary skill in the art would have been realistically motivated to modify whatever semiconductor device can be said to have been reasonably suggested by the combined disclosures of the applied references to arrive at the claimed invention. *In re Lee*, 237 F.3d 1338, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002).

Further, Applicant disagrees that the Examiner has discharged initial burden of establishing the requisite motivation for modifying the particular semiconductor device disclosed by Hembree et al. to provide the heat sink plate such that the convex portions do not protrude from the surface of the sealing member to the outside. In this respect, Applicant would stress that the Examiner is required to make a "thorough and searching" factual inquiry and, based upon that factual inquiry, explain **why** one having ordinary skill in the art would have been realistically impelled to modify the particular semiconductor device disclosed by Hembree et al. to arrive at the claimed invention. *In re Lee at 61 USPQ2d 1443*. That burden has not been discharged.

Specifically, the Examiner has identified wherein Shermer et al. happen to disclose an embodiment wherein convex portions do not appear to protrude from the sealing member to the outside. However, in order to establish the requisite motivation, the Examiner must do something more than point to an isolated feature in a disparate reference. The Examiner must explain **why** one having ordinary skill in the art would have been led by that secondary reference to modify Hembree's particular semiconductor chip in a dramatic manner such that the depicted convex portions 30 in Fig. 3D do not protrude from the surface of the sealing member 48. Such an explanation must be specific-- generalizations do **not** suffice. *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 57 USPQ2d 1161 (Fed. Cir. 2000); *Ecolchem Inc. v. Southern California Edison, Co.* 227 F.3d 1361, 56 USPQ2d 1065 (Fed. Cir. 2000); *In re Kotzab*, 217 F.3d 1365, 55 USPQ 1313 (Fed. Cir. 2000); *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999); *In re Rouffet*, 149 F.3d 1350, 47 USPQ2d 1453 (Fed. Cir. 1998). The Examiner asserted that the proposed modification would "...provide more efficient heat dissipation

for the package device.... (third full paragraph on page 3 of the October 23, 2002) Office Action. Applicant would question the Examiner: **Where** is the factual basis to support that motivation? As held by the Court of Appeals for the Federal Circuit in

Teleflex Inc. v. Ficosa North America Corp., ___F.3d___, 63 USPQ2d 1374, 1387:

The showing of a motivation to combine must be clear and particular, and it must be supported by actual evidence.

The Examiner's reference to column 2, lines 45 et. seq. of Shermer et al. (third full paragraph on page 3 of the Office Action) does not point out wherein improved heat dissipation is linked to forming the heat sink plate such that the convex portions do not protrude from the surface of the sealing to the outside.

Based upon the foregoing, it should be apparent that the Examiner has not established the requisite motivational element. Further, as previously pointed out, a substantial structural difference exist between claimed device and the applied prior art. Ergo, a prima facie basis to deny patentability to the claimed invention has not been established.

Applicants separately argues the patentability of claim 3 which contains the limitations similar to those in claim 1, but further specifies that the heat sink plate adjoins the main surface with a thin sealing member placed on the main surface interposed therebetween, and further specifies that the heat sink plate is formed so that the convex portions do not protrude from the surface of the sealing member to the outside. The particular structure is neither disclosed nor suggested by the applied prior art. Moreover, the structure defined in independent claim 3 yields advantages not apparent from the applied prior art. Specifically, the structure defined in claim 3 enables the heat sink plate to be attached with a sealing member at the same time of encapsulating the

semiconductor chip on the substrate, without special processing and without a separate member for attaching the heat sink plate, thereby reducing manufacturing costs.

Applicant, therefore, submits that the imposed rejection of claims 1, 3 and 5 under 35 U.S.C. §103 for obviousness predicated upon Hembree in view of Tao et al. and Shermer et al. is not factually or legally viable and, hence, solicit withdrawal thereof.

Claims 7, 9, 10 and 12 were rejected under 35 U.S.C. §103 for obviousness predicated upon Schneider et al. in view of Tao et al. and Oogaki et al.

In the statement of the rejection, the Examiner admitted that Schneider et al. fail to disclose the use of external connections and a heat sink having engaging detachable heat dissipation fins. The Examiner concluded that one having ordinary skill in the art would have been motivated to modify the device disclosed by Schneider et al. by providing means for external connection in view of Tao et al. and by providing a engaging/detachable dissipation fin in view of Oogaki et al. This rejection is traversed.

Applicant submits that the Examiner failed to establish the requisite realistic motivation element. As previously pointed out, the Examiner is required to make a "thorough and searching" factual inquiry and, based upon that factual inquiry, explain **why** one having ordinary skill in the art would have been realistically motivated to modify a particular prior art device, in this case the particular semiconductor device disclosed by Schneider et al., to arrive at the claimed invention. *In re Lee, supra*. The requisite motivation must be based on "clear and particular" factual findings as to a specific understanding or specific technological principle which would have realistically impelled one having skill in the art to modify the particular semiconductor device

disclosed by Schneider et al. to arrive at the claimed invention. *Ruiz v. A.B. Chance Co., supra; Ecolochem v. Southern California Edison, supra; In re Kotzab, supra; In re Dembiczak, supra; In re Rouffet, supra.*

That burden has not been discharged. Rather, the Examiner has merely identified wherein Oogaki et al. happen to disclose a heat radiator assembly having a removable threadably engaged portion and then announced the obviousness conclusion. This approach has been repeatedly judicially condemned. *In re Kotzab, supra; Grain Processing Corp. v. American-Maize Products Co., 840 F.2d 902, 5 USPQ2d 1788 (Fed. Cir. 1988).* Indeed, the Examiner merely concluded on page 5 of the October 23, 2002 Office Action, lines 2 through 5:

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Schneider et al. and Tao et al. to provide engaging portions to achieve a positive cooling effect for the package device, as shown by Oogaki et al.

The obvious fact should be stated--the heat sink for the device disclosed by Schneider et al. already has positive cooling. The question which remains unanswered and unexplained on this record is: **Why** would one having ordinary skill in the art have been realistically motivated to dramatically deviate from the teachings of Schneider et al. by providing the heat sink plate with a detachable heat sink thin? That answer is certainly not in Oogaki et al.

Specifically, it should be apparent that the reason for providing second heat sink 8 which is engageable held by the first heat sink 7 in the device disclosed by Oogaki et al. appearing on the fact page of the patent, is to accommodate a variation in the distance (c) between the electronic parts 4 and the heat sink 7, such that minute compensation can be

made with ease by turning the threaded heat sink 8 (column 4 of Oogaki et al., lines 23 through 26). But in the device disclosed by Schneider et al. there is no variation in distance between the planar substrate 10 because the planar substrate 410 is bonded to the die 306 using adhesive 412. Further, even if there was a variation in distance, such could **not** possible be accommodated by bringing fin 414 into contact with the die 306 because it would be blocked by the planar substrate 410.

Another reason which undermines the asserted motivation is the fact that the heat radiator disclosed by Oogaki et al. functions by conducting heat to the shield case 5--an element which does not even exist in the semiconductor device disclosed by Schneider et al. It is for the purpose of conducting heat to the shield case 5 that the first heat sink 7 is provided and the second heat sink 8 formed such that it is engageably held by the first heat sink 7, thereby providing a conductive path directly to the shield case 5, **again an element would does not exist in the device disclosed by Schneider et al.**

Based upon the foregoing, it should be apparent that the Examiner's reasoning underpinning the asserted motivation does not withstand scrutiny. Rather, it would appear that the Examiner has merely identified disparate features in references and then asserted the obviousness conclusion. As previously pointed out, this approach has not met with judicial favor. *In re Kotzab, supra; Grain Processing Corp. v. American-Maize Products Co., supra.*

It should, therefore, be apparent that the Examiner did not establish a prima facie basis to deny patentability to the claimed invention for lack of the requisite realistic motivation. Applicant, therefore, submits that the imposed rejection of claims, 7, 9, 10 and 12 under 35 U.S.C. §103 for obviousness predicated upon Schneider et al. in view of

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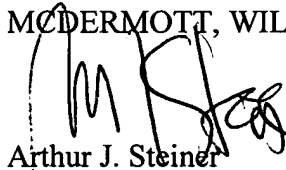
Tao et al. and Oogaki et al. is not factually or legally viable and, hence, solicits withdrawal thereof.

It should, therefore, be apparent that the imposed rejections have been overcome and that all pending claims are in condition for immediate allowance. Favorable consideration is, therefore, respectfully solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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APPENDIX

Claims 1 and 3 now read as follows:

81

1. (Amended) A semiconductor device comprising:

- a substrate;
- a semiconductor chip mounted on the substrate;
- external electrodes provided on the back of the substrate, for connecting electrodes of the semiconductor chip to the outside;
- a sealing member encapsulating the semiconductor chip on the substrate; and
- a heat sink plate fixed by the sealing member, wherein the heat sink plate has concavo-convex portions formed on an exposed surface thereof and is disposed so as to be opposed to a main surface on which semiconductor elements of the semiconductor chip are formed; and
- the heat sink plate is so formed that the convex portions do not protrude from the surface of the sealing member to the outside.

3. (Amended) A semiconductor device comprising:

- a substrate;
- a semiconductor chip mounted on the substrate;
- external electrodes provided on the back of the substrate for connecting electrodes of the semiconductor chip to the outside;
- a sealing member for encapsulating the semiconductor chip on the substrate; and
- a heat sink plate fixed by the sealing member, wherein

the heat sink plate has a concavo-convex portions formed on an exposed surface thereof and is disposed so as to be opposed to a main surface on which semiconductor elements of the semiconductor chip are formed and so as to adjoin the main surface with a thin sealing member placed on the main surface being interposed therebetween; and

the heat sink plate is formed so that the convex portions do not protrude from the surface of the seaming member to the outside.

Claim 5 has been cancelled.

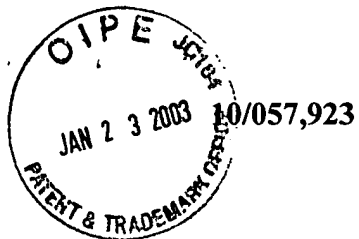


EXHIBIT A

APPENDIX

Claim 1 now reads as follows.

1. (Twice Amended) A semiconductor device comprising:
a substrate;
a semiconductor chip mounted on the substrate;
external electrodes provided on the back of the substrate, for connecting electrodes of the semiconductor chip to the outside;
a sealing member encapsulating the semiconductor chip on the substrate; and
a heat sink plate fixed by the sealing member, wherein
the heat sink plate has concavo-convex portions formed on an exposed surface thereof and is disposed to make direct contact with a main surface on which semiconductor elements of the semiconductor chip are formed; and
the heat sink plate is so formed that the convex portions do not protrude from the surface of the sealing member to the outside.